Policy Options to Reverse the Decline of Wild Pacific Salmon

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Introduction

How can anadromous wild salmon be sustained over the long-term in California, Oregon, Washington, Idaho, and southern British Columbia? To answer this question, we assembled 33 salmon scientists, policy analysts, and policy advocates. A collection of plausible answers is now available in a book recently published by the American Fisheries Society (Lackey et al. 2006a).

The impetus for the Salmon 2100 Project can be traced to a hotel restaurant table in downtown Seattle several years ago. Around this table, a group of veteran fisheries scientists mulled over the conference they had all attended that day.

It was a routine conference — like so many others, and, for many of us involved in salmon science, management, and policy, these professional meetings tend to blur together. As has become typical along the west coast of North America, a group of salmon experts had been assembled to discuss policy and management options that might help restore wild salmon while minimizing the impacts on competing societal interests.

The atmosphere surrounding this conference, similar to nearly all salmon meetings, was a mixture of policy complexity and scientific uncertainty, overlaid with an informal, public veneer of optimism. As always, the unspoken premise of most presentations seemed to be along the lines of: "if the experts could just solve the *scientific* challenges, or if the experts (us) could just get sufficient money to do more of what we are *already* doing, salmon runs could and would be brought back to significant and sustainable levels." Perhaps 1850 runs could not be reached, but surely we could achieve runs that would support fairly heavy fishing by commercial, recreational, and Indian, aboriginal, or first nations' interests.

In contrast to the public conference during the day, the tone around the table in the evening was decidedly different. Yes, everyone agreed, salmon recovery *was* technically complex and scientific uncertainties certainly *do* exist. The limitations to wild salmon recovery, however, were not primarily scientific. Instead, they recognized that dramatic policy changes would have to be implemented if the long-term downward trend in wild salmon abundance was to be stopped, much less reversed. Such policy changes simply were not on the table in most public meetings.

And so once again, nothing presented or discussed had convinced these fisheries scientists and policy analysts that the rather obvious trend would be reversed by relying on current policies. Yes, most scientists agreed that there would be decades of "good" ocean conditions where salmon runs would do *somewhat* better (as the early part of the 21st century has already demonstrated), but over the long-term, the trajectory was downward, unless there were *major* policy changes.

Many of the people involved in the conference were the same ones now sitting around the table, but the tenor of the two discussions was as different as night and day. It was almost as if two parallel worlds existed, the public one with a fairly positive, optimistic perspective about the future of wild salmon; the other, a private one with a highly skeptical, pessimistic assessment of any of the recovery strategies under consideration.

Why the dichotomy? Is there some kind of "conspiracy of optimism" that has overtaken the scientific process? Are fisheries biologists, salmon policy analysts, and salmon advocates creating or contributing to it? If the technical experts are truly pessimistic, somehow that judgment is not being communicated to decision-makers and others responsible for implementing salmon policy. Confusing the issue for this region, perhaps, is the fact that the majority of the salmon caught in California, Oregon, Washington, and Idaho are *hatchery* fish, thus rendering the tenuous status of *wild* salmon essentially invisible to most of the public.

The Salmon 2100 Project

The Salmon 2100 Project began in 2003 as a response to the apparent dichotomy between public and private understanding of the likely future of wild salmon in the region. The overarching goal of the Project was to assess the potential policy options needed to protect and restore wild salmon runs from southern British Columbia southward.

We enlisted 33 salmon scientists, salmon policy analysts, and salmon advocates. They range from hardcore technical scientists to aggressive champions of particular salmon recovery policies, representing a spectrum from quasi-institutional to highly individual opinions. The authors often do not agree with each other, to put it mildly, and several only grudgingly concede each others' right to an opinion about salmon recovery. Nonetheless, all their views enrich the current debate and the book, whether we agree with them or not.

We asked project participants to identify and describe practical policy options that, if adopted, could successfully sustain significant runs of wild salmon in California, Oregon, Washington, Idaho, and southern British Columbia. We did not define what should be considered a significant run, but it was something sufficient to allow for at least some level of sustainable fishing.

Everyone who participated in the project recognized that restoring and maintaining wild salmon in significant numbers through this century is a daunting challenge. Since 1848 with the discovery of gold in California, salmon runs have dramatically declined across the region due to many direct causes: water pollution; loss of spawning, rearing, and riparian habitat from a multitude of human actions; a history of over-fishing; dam construction and operation; water withdrawal for irrigation and industrial cooling; competition with hatchery-produced salmon; competition with various non-indigenous fish species; predation by marine mammals and birds; and climatic and oceanic shifts. These direct causes of the decline were the result of policy choices that arguably reflected society's overall priorities.

The project neither rejects nor advocates any particular policy or class of policies, but we do advocate a serious and informed dialog about the current state of wild salmon, their likely future, and the choices society has to alter that future. The prescriptions offered in the book are universally candid, sometimes uncomfortably radical, and occasionally sobering. Nearly all conclude that major, sometimes wholesale modification of core societal values and preferences will have to occur if significant, sustainable populations of wild salmon are to be present in the region by 2100.

Developing Policy Prescriptions

All Salmon 2100 Project participants were asked to address the same question:

> *What specific policies must be implemented in order to have a high probability of sustaining significant runs of wild salmon through 2100 in California, Oregon, Washington, and southern British Columbia?*

It is a challenging question and one that forced project participants to address society's failure to restore wild salmon. The salmon recovery policy debate is a puzzle that is characterized by: (1) claims by a strong majority to be supportive of restoring wild salmon runs; (2) competing societal priorities which are at least partially mutually exclusive; (3) the region's rapidly growing human population and its pressure on all natural resources (including salmon and their required habitats); (4) entrenched policy stances in the salmon restoration debate, usually supported by established bureaucracies; (5) society's expectation that experts should be able to solve the salmon problem by using a technological scheme; (6) use of selected experts and "scientific facts" by political proponents to bolster their policy positions; (7) inability of salmon scientists to avoid being placed in particular policy or political camps; and (8) the confusion caused by couching policy positions as scientific imperatives rather than value-based societal preferences.

Somewhat surprising to us, nearly every project participant concluded that current recovery efforts have a low probability of successfully restoring or even sustaining wild salmon runs through this century from southern British Columbia southward. None of the project participants considered recovery hopeless and all concluded that salmon recovery could be accomplished. There was, however, considerable disagreement about how best to recover wild salmon runs, but each author was able to formulate at least one recovery strategy or policy prescription that, if implemented, would successfully restore wild salmon runs to significant levels.

Policy prescriptions tend to fall into one of several broad categories. The categories do not form a clean classification scheme, but we developed the following categorizations to describe what was proposed.

Employ Technological Intervention

Several authors proposed habitat enhancements (or replacement) based on existing scientific and technological knowledge, including creation of new streams that replace lost or suboptimal salmon habitat. As proposed, an engineered stream could duplicate or even improve natural habitat by providing excellent security, flow control, and nutrient productivity. While much of the technological and scientific knowledge exists to construct these streams, the proponents recognized that new technologies will be needed for efficient operation and refurbishing of streams. Greater genetic knowledge of local stocks would be critical to maintaining salmon distinct to particular watersheds. These proponents suggest that by using what we currently know about salmon habitat and existing technology, society could reverse the proximal causes of salmon habitat loss including removal of dams, allowing floods, restoring vegetation, and reducing logging and road building.

Several authors argued that supplemental stocking from salmon hatcheries will be required to sustain salmon production at fishable levels. While most authors found fault with current hatchery practices, a few suggested that the controversy over *wild* vs. *hatchery* salmon is misplaced. They argued that the dispersal of hatchery fish to different streams over many decades has resulted in a massive mixing of the gene pool. Recovery programs to achieve genetic purity are thus unrealistic and unnecessary.

Many authors suggested that if a harvestable number of salmon is desired by society, improvements in hatchery effectiveness will be critical. In their view, technology is currently available or could be developed in the near-term to make supplemental stocking a useful tool to assist in salmon recovery.

Apply Ecological Triage

One of the common types of policy prescriptions was a version of protecting the most productive watersheds by concentrating resources and recovery efforts on them. The rationale for adopting such an approach is that we have not had much luck restoring runs once they have become threatened or endangered, in spite of spending billions of dollars and many years in the effort.

Various authors proposed different types of "triage" approaches, but they shared a common philosophy that at least some streams should be managed as refugia where there is no salmon harvest or other detrimental practices allowed. One proposed, for example, a Wild Salmon National Park distributed across the area and purchased with public money. In support of this policy prescription is the observation that one of the most successful methods for protecting endangered species is to provide national parks where citizens are allowed to experience species in their habitat.

Another proposed approach involves creating salmon sanctuaries in watersheds where society has chosen to ensure that salmon will be protected and restored over the next 100 years. A sanctuary system is thus a social commitment to ensure the survival of salmon given the downward pressures they will face in California, Oregon, Washington, Idaho, and southern British Columbia through this century.

With nearly all the triage strategies, there was a reluctance by proponents to be explicit about writing off (from a wild salmon perspective) the watersheds and regions that show little promise for maintaining wild salmon runs through the century. Based on follow-up conversations with these individuals, there was great reluctance to bluntly identify the "downside" of proposed policy prescriptions.

Change Bureaucracy

Several authors apportioned responsibility for the failure of wild salmon recovery to deficiencies in various elements of governance, decision-making processes or procedures, or failures of specific organizations. From the perspective of these authors, successful salmon recovery would require major changes in what we loosely categorized as the bureaucracy.

The prime candidate for overall change was generally described or categorized as institutional arrangements. Criticisms cover the range from institutions being too centralized to institutions that are too fragmented and decentralized.

Several authors observed that bureaucratic institutions, especially state, provincial, and federal management agencies, are particularly stable with many practices, policies, and ideologies supporting the continued existence of the institution rather than the solution of any particular problem.

Authors identified many examples of what they perceive to be institutional incompetence in salmon recovery: applying standard, inflexible rules, protecting the institution (or individual) rather than the salmon, and allowing elected officials and/or citizens to make recovery decisions not based on the best available science.

Policy prescriptions included moving toward a much more decentralized recovery effort with rural residents playing leadership roles. Others encouraged the appointment of government leaders who are more willing to solve problems using the best available science rather than personal policy preferences or philosophical beliefs that appear to be at variance with the majority.

Domesticate the Policy Issue

The prescriptions from some of the authors fell into a category of what political scientists call "domesticating" the policy issue.

Domestication is the process of taking difficult, divisive policy issues off the table until a solution emerges or the problem disappears by solving itself (e.g., the species is extirpated). The most common forms of domestication are funding more research or scientific activity, more workshops and venues to get stakeholders involved through collaboration, and tweaking current regulations or policies that provide the illusion of substantive action.

It is easy to see why offering policies to domesticate the salmon decline policy challenge is easier than developing explicit policies to reverse the decline. Reversing the long-term decline requires changing at least some of the current political realities about the decline: (1) most rules of commerce and economic growth work against salmon recovery; (2) increasing scarcity of key natural resources, especially high quality water, will constrain ecological options; (3) the current trajectory for the region's human population precludes some frequently stated recovery goals; and (4) individual and collective life-style preferences demonstrate that recovery is less important than many advocates assert.

Few authors explicitly proposed ways to change the political realities about the salmon decline issue. Instead, they suggested variations on existing policy options to revise the Endangered Species Act (U.S.) or the Species at Risk Act (Canada), protect more and/or different salmon habitat, create new hatchery practices, change K-12 education, and/or transform people's attitudes.

The domesticating strategies proposed by some authors are requests for extensions of practices already in place and they do not propose revolutionary approaches or challenge existing beliefs. They tacitly assume that at some future time we will formulate and agree on a viable solution. In reality, the public may not even be sure what the problem is, much less know what possible solutions exist.

Some Overall Observations

Given the complexity of our salmon recovery question, we consider the authors who took us up on the offer to contemplate the future of salmon in 2100 as exceptionally brave. They ended up having to reflect on their own training, organizational and professional careers, and political ideologies, which turned out to be a disconcerting experience for many, as described in the epilogue of the book. A few discovered that the political fallout was severe when they expressed personal opinions that differed from the "agency storyline." Several early participants dropped out once they grasped the difficulty of the assignment. Others ended up with conclusions that surprised and disappointed themselves.

The group of authors is diverse, and a handful would much rather not have appeared together between the same book covers. Their diverse policy perspectives aside, very few of them seriously challenged the core drivers proposed by project organizers in Chapter 3 (Lackey et al. 2006b). All thought that, although the wild salmon conservation problem is indeed wicked, there are still workable solutions. Collectively, they believed we need to engage new ways of thinking; we need to recognize that politics and power structures, not science, make natural resource decisions; and that transformation of our approach is essential if indeed we wish to save wild salmon in appreciable numbers by 2100.

Most authors recognized that the way forward will not be through a single solution: more science will not restore significant, sustainable runs of wild salmon if institutional arrangements are inflexible; new institutional arrangements will not restore salmon runs if economic priorities are not reassessed; and technological fixes will not in and of themselves allow us to muddle through this phase of problem solving. There is not a single policy prescription (that has any chance of widespread adoption) that will quickly restore endangered salmon.

The human population trajectory for the region was recognized by all authors as a major policy driver, but most authors effectively accepted the trajectory as an unchangeable fact. Washington, Oregon, Idaho, and British Columbia combined are now home to 15 million humans. Assuming a range of likely human reproductive rates, ongoing migration to the Pacific Northwest from elsewhere in Canada and the United States, and continuing immigration policy and patterns, by 2100 this region's human population will not be its present 15 million, but rather will be somewhere between 50 and 100 million — a quadrupling or more by the end of this century. As with any forecast a century ahead, there is considerable debate, but all authors agreed that there will be many, many more people in the region by the end of the century.

Few authors bluntly and candidly addressed the importance of changing the human population trajectory as part of a recovery policy prescription. There are policy options that would likely alter the expected population growth, but almost no one involved in the Project was willing to propose any such policy changes.

Another chapter author tackled the phrasing and implications of the core policy driver asserting the apparent unlikelihood of widespread and major changes in individual and collective preferences. He noted that it is more important that we stop making linear presumptions (as this core policy driver does) that are often incorrect in a nonlinear world. In his view such thinking leads to the assumption that our own actions do not directly affect the status of salmon or are so small as to be inconsequential.

It would be easy to consider most of the authors to be unrealistic in their understanding of the social and political consequences of their proposed prescriptions, but that would be unfair. Policy changes that would likely work involve values that many people hold dear. Salmon are dependent on habitat that provides water, power, food, and recreation to an increasing number of people in California, Oregon, Washington, Idaho, and southern British Columbia. Practices and policies for providing these services are based on rules, regulations, and values that are deeply embedded in individual, organizational, and cultural value systems. Values surrounding private property rights and individual freedom of choice are particularly deeply held.

Most people report that they want to support the common good of sustaining significant runs of wild salmon, but in our experience, few people, are willing to give up any freedom to decide how to manage their property or how they live their lives. Arguably they are even becoming more reluctant to pay for the sustenance of obviously common goods like public education, transportation, and environmental protection. What would it take for the public and private sectors to give more, much less primary preference, to salmon recovery in their everyday political, economic, and social choices?

Based on informal discussions with the authors, many were well aware of the general reluctance of the public to change certain priorities or behaviors. No one mentioned changing property rights, for example, and only a few suggested stopping or even curtailing fishing. No one suggested abrogating treaties to eliminate tribal rights to a certain portion of the wild salmon harvest. Except for a few brave authors, there was little apparent support for shifting away from hydropower toward potentially more salmon friendly forms of energy production such as coal, nuclear, and/or tar sands. While some authors did propose shifting to renewable energy sources beyond hydropower, few grappled with the fact that without either hydropower or nuclear power, there probably is not enough renewable energy to power the North American economy in the foreseeable future. None of these solutions is socially or politically acceptable given current conditions. If we accept the future challenges, however, we have to accept that some of the current "unmentionables" may become more politically and socially palatable over the next 100 years.

What else is likely to change between now and 2100? Forecasts of the future are based on a few assumptions: (1) until major crises occur, current practices will continue with only slight modifications; (2) there will be major crises (most likely to be related to energy and water shortages); and (3) there will be unimagined technological changes. It is easy to speculate about new forms of energy, for example, but commercially viable, cost effective advances will take decades or longer to develop and deploy.

The Near-term Future

We are currently in a holding pattern since the salmon recovery problem has been largely domesticated politically. As a society, we appear to be waiting for something to change, be it in the science, technology, economy, or even public attitudes, something that will shake us into a place where the problem becomes so apparent that the way forward is both clear and acceptable.

Society may eventually decide that the best we can do is to create large-scale salmon zoos like we have for buffalo in Yellowstone so that our great-grandchildren will have a tangible reminder of California, Oregon, Washington, Idaho, and southern British Columbia of the 1800s. Historians of 2100 may wonder why we spent billions of dollars on recovering salmon when we had so many other pressing needs including poverty, defense, health care, drug abuse, education, crime, and disaster relief. The list of things we could be spending our money on is long and each item has advocates.

Part of the current impasse is caused by the fact that we cannot assess the appropriateness of any policy choice because, as a society, we have not clearly agreed about whether there even is a problem worth fixing.

Conclusion

We want the collective output from the Salmon 2100 Project to serve as court jester, Greek chorus, cage rattler, and straw man to decision-makers, elected and appointed officials, and others who have various mandates to address the decline of wild salmon runs along the west coast of North America. We offer no easy, cheap, painless solutions, but we propose a set of alternative strategies that would likely sustain significant, sustainable runs of salmon through and beyond 2100.

Ultimately, of course, it is the general public that must become knowledgably engaged in salmon policy debates if intelligent, informed, efficacious decisions are to be made. Therefore, we present this book and its policy prescriptions to the general public in a quest to define clearly what would have to change if wild salmon recovery efforts are to have a reasonable likelihood of success.

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Figure Captions

[Photo of early gold mining]

Figure 1. Beginning in 1848 with the discovery of gold in California, various types of mining activities spread to many areas of western North America with a concurrent and immediate decline in some salmon runs. *(Photo courtesy historichwy49.com.)*

[Aerial photo of housing development]

Figure 2. Many areas of western North America have been dramatically altered since 1850. The Pacific Northwest continues to experience population growth rates comparable to some third world countries. *(Photo courtesy of U.S. Army Corps of Engineers.)*

[Photo of salmon hatchery]

Figure 3. Some policy advocates view hatcheries as an integral part of keeping salmon fishing viable, but to others the use of hatcheries continues to be an obstacle to recovering sustainable runs of wild salmon. *(Photo courtesy of U.S. Fish and Wildlife Service.)*

[Photo of large salmon and fisherman]

Figure 4. In order to evaluate the viability of various salmon recovery policy options, the definition of what constitutes a *wild* salmon must be resolved. Scientific information helps clarify the various definitional options, but ultimately the choice of which definition to use is a policy decision. *(Photo courtesy of U.S. Fish and Wildlife Service.)*

[Photo of a large, mainstem reservoir with dam]

Figure 5. Many aquatic environments in western North America have been drastically altered in ways that do not favor salmon. Other fishes, often exotic species, are well adapted to these altered environments and have prospered. *(Photo courtesy of U.S. Army Corps of Engineers.)*

[Photo of irrigated agricultural field]

Figure 6. Water scarcity is a key policy driver that will significantly determine the future of wild salmon in California, Oregon, Washington, Idaho, and southern British Columbia. Agriculture in the arid west often depends on irrigation and is a significant source of habitat alteration that puts downward pressure on salmon numbers. *(Photo Courtesy of US Agricultural Research Service)*

[Photo of salmon fishing by Indians]

Figure 7. The legal and bureaucratic context for developing salmon recovery options is complex. The Endangered Species Act and the Species at Risk Act, coupled with the requirements of various Indian and US/Canada treaties, create additional challenges to negotiation and compromise. Ultimately, all policy choices in salmon recovery involve winners and losers. *(Photo courtesy of U.S. Fish and Wildlife Service)*

[Map of Pacific Northwest]

Figure 8. Extrapolating the past 50-year growth rate of the human population in the Pacific Northwest generates more than 100 million people in 2100. Under this scenario, cities growing together will result in two major urban centers, *Seavan* (Seattle and Vancouver, British Columbia merging) and *Portgene* (Portland and Eugene merging). *(Photo courtesy of Robert T. Lackey)*

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